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Mathematics and Mathematicians.

SIR,—I have just read Mr. Cheverton's explanation on the subject of the claims of mathematical science, in answer to my two last short articles. His last explanation is truly worthy of his two preceding articles. When such assertions are called explanations, nothing in nature need remain unexplained. The most important parts of his communication may be easily refuted from some articles in the Mechanics' Magazine—written by whom, do you think, Mr. Editor? —why, by no less a person than Mr. Cheverton himself. So much, in the mean time, for his consistency.

Having shown, in my last communication, that had it not been for the discoveries of Euler on the refrangibility of light, (in opposition to the opinion of Newton,) the achromatic telescope might have to this day remained a mere speculation, it may not be out of place, before leaving this part of the subject, to mention the great improvements that have been made in these instruments by the late Fraunhofer, a German philosopher, eminently distinguished for his high scientific attainments and practical skill. He has constructed telescopes with the most perfect object lenses, and of nine times any former dimensions, the power and brilliancy of which surpass all former attempts.

One would be apt to fancy, from the account Mr. C. has given, (No. 572, p. 277, col. 2,) of the way in which the Eulers and Bernoullis amused themselves with their experiments on gyratory motion, *tractory curves*,* (untractable curves would surely have been a better name for them), unmanageable equations, &c., that they were wasting their time for no useful purpose. He might, with equal propriety, have applied the same terms of ridicule to Sir I. Newton's experiments in finding the deflecting force of the moon, and many more; or to the experiments of Maskelyne, Hutton, and Cavendish, for ascertaining the mean density of the earth. Of course, all these things, according to the Chevertonian philosophy, are mere matters of moonshine. However, be that as it may, no country has done more justice to the mighty discoveries of Euler than England has done. I shall select, for Mr. Cheverton's edification, a few testimonials in his favor, from the writings of some eminent English mathematicians.

"Euler," says Dr. Hutton, in his Mathematical Dictionary, "was one of the most extraordinary, and even prodigious, mathematical geniuses that the world ever produced," &c.

"The great cultivators of astronomy," says the late Professor Sir John Leslie, "are divided into two classes—'accurate and inventive observers, and profound and original theorists.' Of those illustrious men who, in the lapse of three thousand years, have devoted their labors to so noble a purpose, we may distinguish a few who have stood pre-eminently above their compeers, as observers, Hipparchus, Ptolemy, Tycho Brahe, Hevelius, Cassini, Flamsteed, La Caille, Bradley, Maskelyne, and Piazzi; and as theorists, Copernicus, Kepler, Newton, and, after some interval, Clairaut, D'Alembert, and Euler, and in our own times the associated names of La Grange and La Place."

Mr. Peter Barlow, of the Royal Military Academy, Woolwich, in his English translation of Euler's Algebra, after enumerating some of his wonderful improvements and discoveries in almost every branch of mathematical and physical science, thus concludes:

* Perhaps Mr. C. will favor us with the equations of a few of the simplest of these strange curves.

"Possessing a mind of such wonderful comprehension, and disposition so admirably formed to virtue and happiness, Euler found no difficulty in being a Christian; accordingly his faith was unfeigned, and his love was that of a pure and undefiled heart. The advocates for the truth of revealed religion, therefore, may rejoice to add to the bright catalogue which already claims a Bacon, a Newton, a Locke, and a Hale, the illustrious name of Euler.

"The character of Euler is an object so interesting, that it is difficult to prescribe a limit to reflections when they are once indulged; one is attracted by a sentiment of admiration that almost arises to the emotion of sublimity, and curiosity becomes eager to examine what talents, and qualities, and habits, belonged to a mind of such superior powers."

At the period of Sir I. Newton's decease, Euler had just reached his 20th year, and two years before he was hailed by Newton as a rising star of the first magnitude. The whole of his life was devoted to the benefit of mankind, and in the morning of the day on which he died, (Sept. 15, 1783,) he had been engaged in calculating the orbit of Herschel's planet, and the motion of aerostatic machines.

Mr. C. has associated the names of the Bernoullis with that of the illustrious Euler. The two elder Bernoullis first distinguished themselves by their labors in cultivating the higher calculus invented by Leibnitz; and this powerful analysis was afterwards brought to its present state of perfection by Euler and other continental mathematicians. The fluxionary analysis, invented by Newton, is now, even in England, almost extinct. The long but bloodless war which agitated the scientific world, (the war of problems,) and the high and commanding position the Bernoullis took in that memorable contest, sufficiently demonstrates their great prowess. John Bernoulli, says Leslie, "spent a long life in extending, by the activity of his genius, every branch of mathematical and physical science. He corresponded with all the foreign societies, and the numerous prizes he bore away proved a source of income. His Treatise on Seamanship came out in 1714, and his Dissertation on the elliptical figure of the planets appeared in 1730. But his various philosophical papers were carefully collected into four quarto volumes, and published, in 1742, at Geneva and Lausanne. He died, full of years and of glory, on the 1st Jan., 1748."

From the flippant way that Mr. Cheverton speaks of Kepler, one would be apt to imagine that he considered him only as a fifth or sixth rate astronomer. He allows, however, that he, (Kepler,) *did discover two laws of the planetary motion* which bear his name. *Two* laws! Pray, does Mr. C. deny one of them? I thought every astronomer had admitted that he discovered *three laws*, and here they are:

Law 1. All the planets move round the sun, (or the satellites round their primary,) in such a manner, that a line drawn from a planet to the sun describes areas proportional to the time of motion.

Law 2. The orbits described by the planets round the sun, or the satellites round their primary, are ellipses, having the sun or primary planet in one focus.

Law 3. The squares of the periodic times of those bodies which revolve round a common centre, are proportional to the cubes of their mean distances from that centre.

Perhaps this last law of Kepler is rejected by Mr. C., as he may have discovered that it is not in accordance with his own theory on the motion of bodies in resisting mediums. I would recommend him to read the Life and Discoveries of the great Kepler, by the Rev. Dr. Small, of Dundee.

I have still, Mr. Editor, some other remarks to make on this subject; and if you will allow me to continue them, for at least one paper more, I will feel much obliged to you. In the mean time, I am, Mr. Editor, yours, with respect,

LEWIS FREND.

Basil, Sept. 15, 1834.

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The Claims of Mathematical Science.

SIR,—I much regret that, in honoring your pages and myself with some remarks on my recent article on mathematics and the mathematicians, Mr. Exley did not extend his observations to a greater length, for he is well entitled, because he is well qualified, both as a mathematician and a philosopher, both as a man of universal information, of varied learning, and

of powerful ratiocination, to pronounce an opinion on the subject in discussion, deserving the most respectful attention. I am the more bound not to withhold a proper tribute to his merits, because I have already taken, and may have further occasion to take, exception in some degree to his theory of physics, and in the present paper intend to offer some strictures in opposition to his remarks. Not that I would deprecate, or admit the necessity of deprecating offence: for so long as observations are offered in the love of truth, and uncontaminated with that uncandid and captious spirit which controversialists, (even among your correspondents,) are too apt to evince, I am fully assured they will be received with "that stronger attachment to truth, than to any erroneous system," which he professes to entertain.

I fear, from his too short but pithy remarks, he has imbibed the impression, that I have labored to decry mathematical science, though my observations, he will observe, are on its *comparative* value and importance. Nay, it is quite in accordance with my views, that even "the mere mathematician is not to be set aside;" for, almost at the very outset, I stated that this class of men "are, doubtless, *valuable members of the body scientific*, but that some among them (the least generally informed) are sadly inclined to over-estimate the honor of their station, and the comparative value and importance of their labors." Apart, therefore, from and besides its obvious misuses, there is surely sufficient ground for animadversion in the fact, that the excessive reverence for this science, (be it usurped or freely bestowed,) which so much prevails, facilitates with a baneful influence on the best interests of philosophy, a too favorable reception for every thing, however crude, which is presented to us clothed in its forms. It certainly is within the verge of useful discussion to consider, whether the primitive and long acknowledged claims of this science to just respect have not *in our day* bribed, and even forced our reason, by its inordinate but imposing pretensions, to a false, because extravagant, estimate of its value and importance. It is true, as Mr. Exley says, "that no one will plead for the misuse or misapplication of the science;" but then there are many who will debate what is or is not deserving of that reproach, and, in the general prostration of the mind to mathematical genius, the danger is that we may esteem as legitimate what may prove to be of spurious birth.

In the rapid march of knowledge—the knowledge of nature,—the general mind has been strengthened and freed, in some measure, from this prejudice; but the time was when it was thought no misapplication of mathematical science to apply it to human physiology—when even the fanciful hypothesis of celestial vortices was thought to be illustrated and particularized in man's bodily frame; and the time may be, when applications now accepted may be thought to be a misuse.

When the mathematics was the only science of which mankind had to boast, it was naturally regarded with unbounded veneration. When the vain philosophy of the schools was discarded, it presented fresh claims for admiration and regard. The feeling has descended to our times, though the circumstances which justified it have passed away. Philosophy has entered, and is daily entering, on other domains than those of quantity; and that science is now but auxiliary, and only occasionally, to more enlarged, and, let me add, more highly intellectual pursuits. Yet an antiquated and almost exclusive admiration still clings, though with a faultering hold, to the public mind, equalled only by one other prejudice—the reverential respect which is yet awarded to classical learning: these have been respectively fostered by the two Universities, once truly the lights of a by-gone age, but which are now visible only in the pervading darkness of their own precincts.

High mathematical knowledge is not to be turned to account in the ordinary walks of life. Besides, even where the sphere of its exercise is not wanting, other higher and rarer endowments of the mind—those which constitute the philosopher—are requisite to enable its possessor to bring it discreetly and powerfully into operation. Is it not infatuation, then, to allow the mere power over an instrument of knowledge to usurp the place in our estimation which should be assigned to its adroit and skilful use in

its wise and efficient applications to appropriate and useful objects? And is it any thing better than infatuation, when we hear it said of any one that he is a great mathematician, if he be nothing better than this, to look up to him as being qualified, in virtue thereof, to take the lead in the ways of knowledge, and to ascribe to him pre-eminent intellectual powers? Some mathematicians will not countenance this delusion. It was said of one of the celebrated French analysts, that he expressed his surprise at finding the study of chemistry to be not more difficult than that of the mathematics; and a distinguished living mathematician is accustomed to say of any thing of little difficulty, that "it is as easy as algebra:" an expression which will find a readier acquiescence; but still it shows, that in this gentleman's opinion, this *kind* of study is not very arduous.

I have just adverted to the two branches of learning which separately distinguishes each University, and which, if not pursued to the entire exclusion of other studies, characterises and gives celebrity to those places respectively, and to which honors more particularly appertain.

Mathematical knowledge and classical literature, it is readily admitted, are of great value, and it would manifest unusual stolidity to deny it.* It is even proper when peculiar aptitude ensures success, that for the purpose of attaining high excellence some should devote their attention almost exclusively to their study; but in regard to persons in general, among whom it would be folly to expect that Parrs and Eulers may abound, and not desirable that they should, it is contended that too much useful time, yea, too many of the world's interests, have been sacrificed to the pursuit of these attainments, which unavailing and unproductive, probably, in their end, have been stimulated only by a false opinion of their all-engrossing importance. The fault consists in allowing brilliant instances of particular and perhaps professional attainments, to seduce our judgment into a magnified estimate of their value, or into a diminished opinion of general acquirements being essential to a liberal education, but which general knowledge, after all, may in many cases be highly conducive to success in the more favored pursuit, and must in most cases be absolutely necessary, in order to render that pursuit, in its application, beneficial to society. Ardent youth is naturally impelled to tread, though with humble steps, the path which men of distinguished talents have irradiated with the halo of their glory. Fired with enthusiasm, all his energies are engaged to follow up the chosen track; he becomes insensible to every thing besides; he is deaf to the voice of wisdom; he responds not to her calls to explore the other avenues of knowledge, but contemptuously regarding them as by-paths, insignificant and obscure, he pushes on, till at last he faulters, and finally he falls short of the high object of his aims; meantime he has lost the goodly prospects which awaited him on every hand, he has enjoyed only a few contracted views, he has had some partial glimpses, and which, to his purblind vision, have appeared to be all that was worth a thought in nature's wide expanse, showing that those illustrious men who, not improperly, have been called the lights of the world, may, under some circumstances, truly prove to be lights, also, which "lead to bewilder, and dazzle to blind." Admit that the aspirants to honor and distinction have succeeded to the very stretch of their ambition, and what do we have as the most favorable result, but men of one idea, men of an exclusive theme, men admirably suited to become the professors of their peculiar learning, but who, in the ordinary affairs of life—yea, in the ordinary walks of knowledge,—manifest a simplicity, not to say an imbecility, which makes even the illiterate smile. Their vocation may be honorable, and the sphere of their duties useful; but still it is the sphere of a class of individuals, and for that reason they ought not to be considered as being the exemplars of the course of study befitting the community of the learned.

* Why should Mr. Frend continue to impute such nonsense to me, by stating my explanations on this point to be unsatisfactory? Is it impossible, then, to a mathematician to take any other than *extreme* views of a subject, unmodified by influential considerations? or to entertain any other than *ultra* and abstract opinions? To such a course his mind is certainly biassed by his studies; and does not Mr. Frend himself furnish a case in point? To persons of this cast, any thing like discrimination carries the appearance of inconsistency or contradiction.

Besides, though well qualified to be instructors, would they be less, or rather, would they not be much better adapted for that office, if they had taken a more varied and extended survey of things? Would they not enlighten, and more intensely interest us, with illustrations and analogies gathered together out of all the territories of knowledge? Would not their observations be more marked with wisdom, their positions advanced with greater discrimination, and their principles receive that salutary modifying and moderating correction, which enlarged and liberal views fail not to enforce? And, as members of society, would they not be less exacting and less monopolizing of claims to paramount consequence for themselves and their pursuits? Would they not be more moderate, more accommodating, and more distinguished for amenity in general intercourse, and in the transactions of general affairs? In the multifarious concerns of busy life they are manifestly incapable of taking a judicious part. The ruling spirit of their theme mars all their perceptions, sways all their opinions, gives a tinge to all their thoughts, and particularly spoils the faculty of taking a correct estimate of things, for they always refer to their own pursuit as the standard by which they judge of the value of others. The observations contained in this paragraph have been suggested, and may have been illustrated, by some passing events of the day, which it would be indecorous to specify, but the parallel of which most persons will be able to furnish for themselves. I have also to apologise to Mr. Exley for introducing them in this correspondence, for nothing relating thereto, or to him,* has called them forth. They are also becoming too general, for they apply to other subjects besides the mathematics; let us, therefore, return to that which is more immediately before us.

Mathematical knowledge was the first acquirement of man, as it is of men. This is, as Mr. Exley properly remarks, the order of nature; but it is significant also of the simple and elementary nature of the procedure of the understanding by which it is disciplined to its attainment, and it was for the purpose of showing this that the quotation from Blakey's logic was introduced. That it is not more general—that so many "neglect or reject their birthright," as Mr. Exley considers it to be—must not be attributed then to the strong intellect possessed only by a few, which is requisite for its acquirement, but to the repulsive manner, probably, in addition to its not being in itself very attractive, in which it is first presented to our notice. The point which I wished to establish, and to which the testimony of Mr. Exley is the more valuable, because he is peculiarly competent to give it, is the fact, that the mathematics is quite within the reach of ordinary talent. Though I admit, with Mr. Exley, "that mathematics is the first science in the order of nature," it does not follow that I ought also to admit that it is pre-eminent in honor and utility, which it was the drift of my observations to disprove; for mere priority confers no particular value, else would common arithmetic have pre-eminence over the mathematics itself, to which it is the first or elementary step.

Mr. Exley asks, "Why should mathematics be set in opposition to practice? Had Priestly, Franklin, and all practical men, the inventors of steam-engines, and others, been great mathematicians, could this have made them less practical, or less successful in their practice? Who was more practical than Newton? His optics present a model for all practical men." I would say, in reply, that, in all probability, if these men had been great mathematicians they would not have been what they were—the benefactors of mankind; and in proof of this, I refer to what is indisputable, that the great mathematicians have not been practical men, and that the most eminent and successful men in practice have not been mathematicians. It is a curious fact in psychology, which I have in my

* I remember, however, that a paper from Mr. Exley, read before the Royal Society, met with very cavalier treatment, in one quarter, merely, it would seem, because it did not chime in with particular individual pursuits; and we all know what intestine broils existed in that learned body, for want of, not to say mutual assistance, but even mutual toleration, among the respective partisans of the several branches of science, and which, as having occurred many years since, may now be properly adverted to as examples for warning and instruction. Let us hope that the British Association for the Promotion of Science will introduce a new era of harmony and co-operation.

previous paper endeavored to explain, that these separate pursuits do not proceed together with an even flow, but that one occupies the mind almost to the entire exclusion of the other. Of course there are exceptions, else would the proposition be not the enunciation of a general fact, but a mere truism. Newton was an illustrious exception, and I had myself referred to him as such. He was more than possessed of practical views; he was an operating experimentalist, and a very ingenious one too, and a clever operative mechanic to boot. May I be permitted to say, that these remarks have been occasioned by one who is also an exception, and therefore it is that those pursuits do not appear to him to be discordant. It is true, as he intimates, that they are not "to be set in opposition," if by that he means *irreconcilable* opposition to each other, but rather in juxta-position, by the way of foils and antithesis; but though there is no necessity in the nature of things, there is great probability in the reason of things, that great attainments on either hand should mutually disqualify the mind for the opposite pursuit, and every probability in the course of things that they should incapacitate it—the one for the reception of the other. This view of the subject may appear to some to be better corroborated, by using the converse expression of the fact before stated, that those who have made equal attainments in both pursuits have commonly not been eminent in either. It will be admitted, however, that there have existed an illustrious few, to whom opportunities have not been denied for the exercise of abilities equally rare. The late Dr. Thomas Young was eminently distinguished for practical views; they pervaded and characterised all his studies, and gave a peculiar tone to those which were the most abstract; though, like the gentleman on whose remarks I am now commenting, uncontrollable circumstances may have confined his aims, more than others, to the closet rather than to the laboratory. If, however, these pursuits, so distinct in themselves, are more commonly pursued apart—a course, be it remembered, which is not recommended—it is surely very properly open to discussion, without setting them *injuriously* "in opposition to each other," whether the one or the other is the more arduous, the more useful, the more honorable, or the more intellectual. Without pretending to decide in a case where personal predilections will turn the scale, it is enough for me to put in at least an equal claim to these distinctions in favor of practical pursuits, as including those which are observational, inductive, and experimental; or to bar the speculative one, at any rate, from carrying off all the honors—a triumph which it has been too much the custom to concede to it. I have advanced these claims to estimation not particularly on the ground of utility, which is surely undeniable; for geometry of the highest order, and the science of quantity generally, and as applied to the motions of the heavenly bodies in particular, flourished for ages on the Ganges, without any beneficial influence on the interests of mankind, and was imported into, or revived in Greece, without superseding, or even correcting, the Stagirite's logic and philosophy; but I have advanced them more especially on the bolder and less usual plea, of at least equal if not superior intellectual powers, and as much patient and laborious perseverance being required in those pursuits which trace the connection of *things*, as in that which establishes a connection of *ideas*—in those pursuits which unravel to the core, as in that where we have the naked essence already formed to our hand—in those pursuits which take the subject matter to disembarrass it of its extraneous envelopement of circumstances, as in that where we can conceive of it at will abstractedly, and work with it as such wherewithal—in those pursuits, I say, where, having arrived by an extensive analysis at the elements or principles which are the objects of our research, we have to embrace, in their natural order and degree, the whole circle of combining influences, however diverse in their nature, ere we can erect a philosophic system, or advance a true explanation of phenomena or events, as in that where the materials of a simple though imposing superstructure being called into existence at our bidding, and impressed with qualities at our pleasure, are of one and the same nature, of restricted and homogeneous influence, de-

void of interfering and collateral action, and only require for their regular collocation an unembarrassed unilateral proceeding. Besides the reasons now incidentally alluded to, as subsisting in the inherent differences between the separate subjects, I may adduce in proof of my position the indisputable fact, that the speculative science advanced by extensive strides, and was brought to a comparative perfection at a very early period from its foundation; whereas the practical sciences approached to maturity only by slow degrees, and are yet in progress, showing that the difficulty in one case is of a character to be easily and quickly surmounted, and in the other that it is more formidably intrenched. Again, those rapid advances were made comparatively by a few individuals, and though it seems paradoxical, it is not the less true, it was precisely because the laborers were few, that those advances were rapid, extensive, and broadly seen; for if the nature of a work be so toilsome and different as to require a great number to engage in it, the steps of its progress, though innumerable, must necessarily be minute and scarcely perceptible. The speculative science, therefore, must come more naturally and easily within the compass of our faculties, since a few has sufficed to cope with it, and reduce it to order. The paucity of laborers sufficient to produce great effects, argues also that this science does not demand much more than ordinary talents, since the chance of finding those which are extraordinary is in such case greatly lessened. I cannot, however, go so far as to say with Mr. Exley, "we need not wonder, then, that all men are born mathematicians, though many neglect or reject their birthright." This would be to humble their pretensions, more than any one, besides a mathematician, dares to do.

In my next communication I intend to notice those observations of Mr. Exley which refer to his own theory of physics, and to take a slight review of it.

I am, sir, yours, &c.

BENJAMIN CHEVERTON.

October 20, 1834.

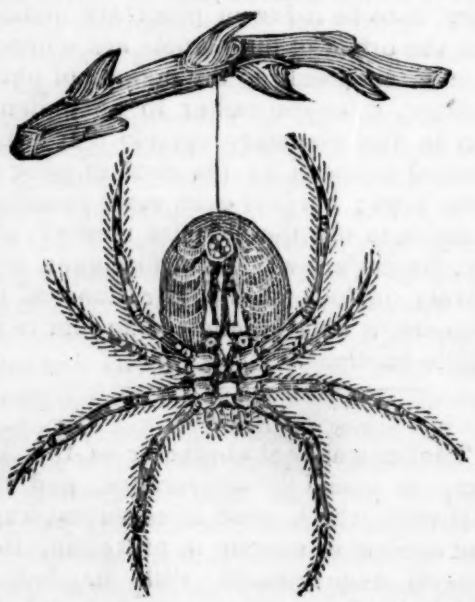
P. S.—Mr. Frend has very unnecessarily occupied your pages in quoting various testimonials in favor of Euler and the Bernoullis, for, unquestionably, they were illustrious mathematicians, and I stated as much. As to the *tractory* curves, which he thinks are improperly named, I can only say they were so called by Euler himself, though they defied even his skill to render them *tractable*. The witticism that Mr. Frend founds on this poor equivoque, is about as smart as his invitation to me to give the equations of a few of these "*strange curves*," in which attempt even Euler failed. He further allows himself to say, that certain highly useful *experimental* researches, which he enumerates, "are of course, according to the Chevertonian philosophy, mere matters of moonshine." I would respectfully inquire of Mr. Frend, why he thinks it necessary to resort to misrepresentation, and why the calm face of philosophic discussion should be disfigured with the ebullitions of temper? Those who honored my paper with a perusal, will not be induced by any one to believe that its purport was not precisely to establish the superiority of practical and experimental pursuits over those which are speculative. Mr. Frend has discovered an omission in my enumeration of Kepler's laws, which he contends were three. He is perfectly at liberty to consider it to be *a law* of planetary motion, that the orbits of the planets are ellipses, though, according to my notions of phraseology, it ought rather to be called *a fact* in the planetary system. It is not unusual to speak in the *dual* number of these laws; but it is even more common, perhaps, to use the singular number, and say, Kepler's law. As a foreigner, sensitively jealous of the fair fame of foreigners, it may be allowed to him to be a little captious.

Spiders.

The unamiable character of this insect, its unsightly appearance, and the zeal with which good housewives wage war against it, concur in preventing that general acquaintance with its habits, which its frequent occurrence, and domestic and sedentary mode of life, render of such easy attainment. The following account, though it adds nothing to the stock of existing information on the subject, affords details which to some of our readers will be new and interesting.

The characteristics of the whole class (*Aranea*), of which the species are many, may be thus stated. All spiders differ essentially in their internal structure from insects proper, and their external form is very peculiar. The feet are always eight in number, instead of six, as in insects, terminated by a moveable hook; the eyes are eight, or, though very rarely, six. The eight eyes of spiders are immoveable, and of a structure different from those of insects. As each consists of only one lens, it is deprived of the power of multiplying objects, and from its immobility, it can only perceive those which are placed immediately before it. The distribution of the eyes differs greatly in different species, but they are always disposed in such a manner as, with their number, to meet the deficiencies indicated, affording a beautiful instance of those "compensations" to which the attention of the student of nature is continually drawn. Spiders do not undergo metamorphoses, and all envelope their eggs in cocoons of silk, varying in form and texture in the different species.

The process by which the web of the spider is woven is always open to observation. There are five spinnerets or teats

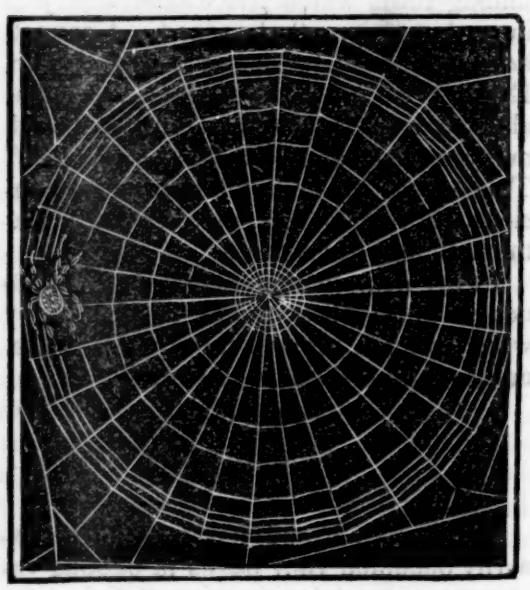


Garden Spider, (Epeira diadema,) suspended by a thread proceeding from its spinneret.

near the extremity of the abdomen, the apertures of which the insect can contract or enlarge at will. These apertures communicate by a tube with four reservoirs containing the gluey substance of which the thread is spun.

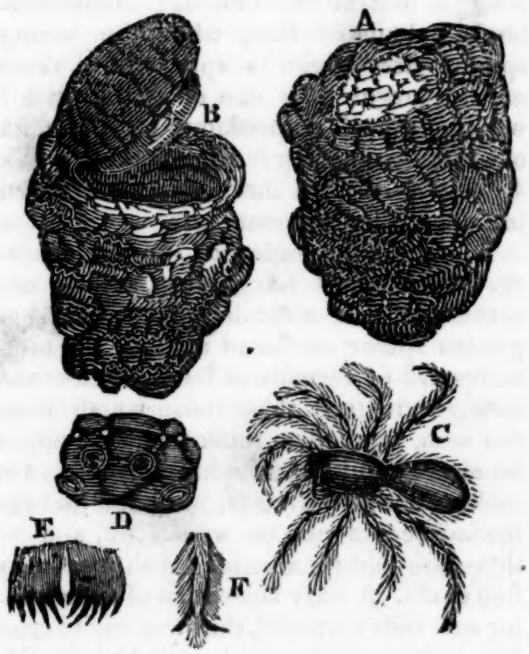
When the common house spider purposes to form a web, she generally chooses a place where there is a cavity, such as the corner of a room, as well to facilitate her escape in time of danger as for the advantage afforded of more complete inclosure. Having chosen a situation, she fixes one end of her thread to the wall, by applying her spinneret, and then passes to the other side, the thread following her as she recedes. After fixing the other end of the thread to the opposite wall, she returns, and thus passes to and fro, until as many parallel threads have been made as she considers necessary, when she begins to cross them by other parallel threads. Thus are formed the toils or snares designed to entangle flies and other small insects. But, besides this large web, she generally weaves a small cell for herself, where she lies quiet and concealed, waiting for her prey. This cell is sometimes in the centre of the web, but when not so, a connection is established by means of threads, which not only inform her, by the agitation communicated to the cell, when any thing touches the web, but enables her to pass quickly in order to secure the captive struggling in her toils.

There are other methods of weaving peculiar to different species of spiders, but which our limits will not allow us to enumerate. The following figure exhibits the geometric net of the garden spider.



Several species of spiders construct a cylindrical web under the ground, with a lid connected by a sort of hinge, which the inhabitant of the cell can open and shut at pleasure. In a volume entitled "Insect Architecture," will be found some very curious details of these contrivances of mason-spiders. The following offers an example of these wonderful exertions of instinct:

"Another mason-spider (*Mygale cæmentaria*, LATR.), found in the south of France, usually selects for her nest a place bare of grass, sloping in such a manner as to carry off the water, and of a firm soil, without rocks or small stones.



A, the nest of the Mason-Spider, shut; B, the nest open; C, the spider, (mygale cæmentaria); D, the eyes, magnified; E F, parts of the foot and claw, magnified.

She digs a gallery a foot or two in depth, and of a diameter (equal throughout) sufficient to admit of her easily passing. She lines this with a tapestry of silk glued to the walls. The door, which is circular, is constructed of many layers of earth kneaded, and bound together with silk. Externally it is flat and rough, corresponding to the earth around the entrance, for the purpose, no doubt, of concealment: on the inside it is convex, and tapestried thickly with a web of fine silk. The threads of this door-tapestry are prolonged, and strongly attached to the upper side of the entrance, forming an excellent hinge, which, when pushed open by the spider, shuts again by its own weight, without the aid of spring hinges. When the spider is at home, and her door forcibly opened by an intruder, she pulls it strongly inwards, and even when half-opened often snatches it out of the hand; but when she is foiled in this she retreats to the bottom of her den as her last resource.

Some spiders are aquatic, and spin a cup-like web, which answers the purpose of a diving bell, under which they disengage the air they bring down from the surface, and pass their lives feeding on aquatic insects. Some spin no web, but take their prey by running; others, by approaching quietly till within a certain distance, when they suddenly spring upon their prey.

The means which spiders employ in transporting themselves from one place to another are not a little curious. When the insect is inclined to change its situation, it hangs itself perpendicularly by a thread, and turning its head towards the wind, shoots out others from behind, which are wafted about by the air, until they fasten on trees, walls, and other bodies; when the spider finds that the threads have attached themselves, which it ascertains by pulling them in with its feet, it uses them as a bridge to pass to the place where they are fixed. Such threads are frequently seen running parallel to the horizon, from one wall to another in a house, from one tree to another in a field, and even from wall to wall across gardens of considerable extent. That spiders had the means of floating through the air appears to have been first ascertained by Dr. Lister and Dr. Hulse, towards the end of the 17th century. After the insect has, in the manner just described, thrown out one or more threads to the length of several fathoms, it snaps that from which it hung, and then floats away with the wind; and although, of course, it cannot proceed against the wind, it seems to have some control over its own course, using its feet in the way of oars to steer, and perhaps, in some measure, to row. Many theories have been attempted for the explanation of this phenomenon; amongst others that it depends upon the electrical state of the atmosphere.

The height to which they can attain is

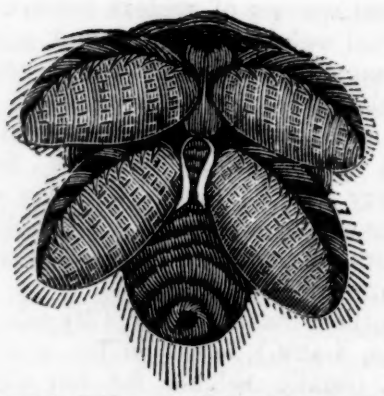
very surprising. In a letter to Mr. Ray, Dr. Lister mentions that in October, 1670, he observed the air to be very full of these webs, and immediately ascended to the top of the highest steeple of York Minster, and could there observe them still very high above him. Autumn is the principal season for these aerial voyages, though they are occasionally undertaken at other times in clear and calm weather. As these floating webs are, like those in the lower regions, frequently garnished with legs, wings, and other marks of slaughter, it is concluded that the spiders capture gnats and other insects in their passage. In all stages of their existence, spiders prey with the most savage ferocity on all insects they can overcome, and also upon one another. Spiders seize and kill their prey with a pair of sharp, crooked claws, or forceps, placed in the fore part of the head. They can open or extend these pincers as occasions require; and, when undisturbed, they suffer them to lie one upon another. It is affirmed that the spider injects a poisonous juice into the wound it makes. They cast their skins once a year, and they perform this operation by suspending themselves in some corner, and creeping out of their case. These skins are found in the webs dry and transparent, with the legs attached to them.

It should be observed that the apertures in the spinnerets of the spider, from which the viscid matter which forms the web is emitted, are exceedingly numerous. M. Reaumur often counted 70 or 80 in a single teat by means of a microscope, and could perceive that there were infinitely more than he could enumerate. It is computed that there are about 1000 apertures in each teat; and, as there are five teats, each thread of the spider consists of 5000 separate fibres, which are united at a very minute distance from the teats.

To give an idea of the wonderful tenuity of the thread of the full-grown insect, it has been computed that an ordinary human hair is as large as 10,000. But this is not

"The spider's most attenuated thread,"

for the young begin to spin as soon as they leave the egg; and how fine must the thread be which is drawn from the



Spinnerets of a Spider magnified to show the spinnerules.

minute apertures in the teats of insects whose whole bulk does not equal that of a single teat of the mother! Leeuwenhoek calculates that, when the young spiders first begin to spin, 400 of them are not larger than one of full growth; we may therefore presume, on the data of the preceding computation, that 4,000,000 of such threads do not exceed in bulk a single human hair.

About the beginning of the last century, M. Bon, of Languedoc, having observed that a short-legged species of garden spider enclosed its eggs in bags composed of threads of much thicker and stronger texture than those which form the web, was led to think that they might be manufactured into a kind of silk. On making the experiment, he found that the threads could not be wound off, and he therefore had them carded with unusually fine cards. A silky substance of an ash color was thus obtained, that was easily spun into fine and strong threads, which M. Bon caused to be manufactured into gloves and hose, and found that three ounces of this material would make a pair of stockings for a large man whose common silk stockings weighed between seven and eight ounces. The result of M. Bon's experiment, and the actual production of the manufactured articles before the Royal Academy of Sciences, led to very sanguine expectations of the benefit which might be derived from these insects. But M. Reaumur, who was appointed by the Academy to investigate the subject, made a report which completely discouraged the expectations which had been raised. He stated that the natural ferocity of the spiders renders it impracticable to breed and keep them together. He distributed 4000 or 5000

into different cells, in numbers varying in each cell from 50 to 200, and fed them with flies and the bloody ends of young feathers; but the smaller insects were soon devoured by the larger, so that in a short time there were but one or two left in each cell. To this disposition in spiders of devouring one another, M. Reaumur attributes their comparative scarcity, considering the vast number of eggs they lay. It is thus impossible to establish the insects in a community; and, if it were practicable, more room and attention would be required than the produce would recompense. A much greater number of spiders than of silkworms would be necessary to produce the same quantity of silk; and the bag of the spider is, after all, much inferior to that of the silkworm both in lustre and strength. M. Reaumur computed that 2304 worms will produce a pound of silk; and as he considers the work of 12 spiders only equal to that of one silkworm, a pound of silk would require 27,648 spiders; and as the females only form the bags to deposite their eggs in, he supposes it would be necessary to have an equal number of males; so that, in order to obtain a quantity of silk equal to that furnished by 2304 silkworms, it would be requisite to keep 55,296 spiders.—[Penny Magazine.]

Mr. Nutt's System of Bee Management.

[From the London Mechanics' Magazine.]

Mr. Editor,—After the notice of Mr. Nutt's intended publication of a Treatise on the Management of Bees, I anxiously waited for its appearance, and became possessed of a copy. After reading it through I wrote him a long letter, inquiring the cause of the opposition he stated he had met with, and offering my services gratuitously to introduce his system in the West of England. This letter Mr. Nutt (in an answer to a letter sent subsequently to his agent in London,) says he never received, and as the dead letter office has not returned it, the inference is, that it must have been improperly intercepted by some one—by one of those, perhaps, whom Mr. Nutt classes as his very "particular friends." Be this as it may, a misunderstanding between us has been the consequence, and our correspondence has ceased. I shall say little now, either of Mr. Nutt as an author, or of his friends who defend him. My purpose in addressing you is simply to state a few facts favorable to Mr. Nutt's system, which have come within my own experience, and which seem to me to invalidate the principal objections brought against it by your anonymous correspondent J. P. T.* Nor should I have condescended to answer a person who seems afraid to be known in his attacks on an inoffensive individual, were it not that the Editor of the Mechanics' Magazine has in a manner identified himself with J. P. T., by the note which he has subjoined to one of his communications.†

First, then, as to "swarming from necessity or choice." I have two sets of collateral boxes, one stocked on the 24th, the other on the 28th of May last. The bees have filled the first with combs and honey entirely. One side box is full of combs, and partly full of honey. The bell-glass is about one third full of combs, and partly supplied by honey also; my bell-glasses will contain twice as much as the largest I have seen from Mr. Nutt. From this it must be evident that my bees must have swarmed "from necessity," had I not prevented this by the "move" recommended by Mr. Nutt, or something else tantamount to it. That they did not *choose* to swarm is evident from the work they performed after an enlargement was granted them. The swarm in the second set of boxes has filled the centre box and the glass just the same as the other; added to which, each swarm has partly filled another box, and then returned to the colony. (See hereafter.)

Mr. Nutt's glass on the centre box is not an abandonment of "his so much lauded ventilating system," that glass being itself also ventilated.

The comparing Mr. Nutt's prevention of swarming to a farmer preventing his

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* See page 237, vol. iv., of this Magazine.

† Not so; we only so far sided with our correspondent, as to say that his strictures had led us to think less favorably of Mr. Nutt's system and his book than we originally did, and that these charges had not been met as they might and ought to have been, if *unfounded*, by the two other correspondents who undertook Mr. Nutt's vindication, and who, we may add, are persons that must be able, if any body can, to vindicate it most effectually.—Ed. M. M.

ewes having lambs is not good reasoning. If a farmer could make his ewes to produce mutton and wool without the butcher's knife, then the cases would be parallel; but Mr. Nutt's plan is to get the honey without killing the bees. The moment the bees become too numerous for the box where they are first located, they are permitted to enter another box that is empty; the full one has its contents removed, and again is replaced on the stool until wanted, and so on. How, then, can the comparison be borne out?

I do not know what Mr. Huish means by his bees being "very lively," when the thermometer fell 20° below freezing. My bees are never *very active* when the thermometer is 20° above freezing. I would also add, that I attribute my success in keeping bees, when many of my neighbors lose them, to the simple circumstance of mine being out of the influence of the sun during winter; in fact, my hives are for weeks, and even months together, as still as if no bees were in them.

In reference to *moving bees*, we pay no attention to it in this part of the country; we move them to suit our convenience, as in changing of residences, selling or exchanging hives, putting them out on the half, and so on—never supposing but what bees can find their way back to any place from whence they have once started; we always, when we do remove them, do so after they are quietly housed at night.

Your correspondent says, "Mr. Nutt has so mystified the description of his hive that no person in the world can understand it." Now mark this, sir: my boxes were all made with their appendages according to the directions and plates given in Mr. Nutt's Treatise, *since which* I have seen a set from Mr. Nutt, sent to a lady near Penzance, and I find that I have not mistaken him in any one point. So much, then, for your correspondent's acuteness of perception. Another striking proof of it is, that he cannot understand the size of the dividing tins to be inserted between the boxes, when preparing to take off a side box. Of what size should they be? Surely, long enough and wide enough to stop the communication between the two. Attend again to what he says of regulating the temperature: "After all the fuss, too, about thermometers, there is no mention made in this chapter, nor any part of the book, where they should be inserted into the hive." Why, into the ventilator, to be sure, which is a perforated tin tube placed there on purpose.

To show, further, how carelessly, as well as with what prejudice, your correspondent must have read Mr. Nutt's treatise, he calls a mere block, or door, if you please, a drawer in common with the feeder, which is a drawer. These block fronts I used this season to try the experiment of taking off a side box, in which I so far succeeded that I did not injure a SINGLE BEE, that I could discover. I introduce the dividing tins carefully and slowly between the boxes, as directed by Mr. Nutt, although your correspondent says Mr. Nutt gives no such directions. There is no frame-work needed to support the combs: this I have proved over and over in cottage hives, and never even put a pin through the crown, as some persons do. I have proved it also in the boxes and glasses to my entire satisfaction. My bees, on being admitted into a side box, will take possession without "coaxing" at all. I take the box, clean it well out, rub it with a little honey, the smell of which will remove all other, if any existed, though I know not that it is at all needful; but we always prepare cottage hives to receive a swarm by rubbing it with something to make it grateful to them. I should think in about two or three hours after the communication was opened, in the three cases I tried, bees to the quantity of good swarms took possession of the boxes, and remained quietly to work as in the boxes they before occupied.

I do not recollect Mr. Nutt saying "he cannot himself, without great difficulty, take a box away from his own hive." I had no difficulty, danger, or accident to myself or to the bees, in two experiments tried this season—the boxes with the combs still remain for inspection. Your correspondent also says, in reference to Mr. Nutt's letting a swarm hang with a sheet before them until evening, that "my bees with such treatment would have fled away." A man I know in Breage told me this summer that he has frequently shook his bees after he had re-

turned from Wheel Vor, a distance of three miles, after six o'clock in the evening, and on one occasion they swarmed so early as nine o'clock in the morning. The first swarm of my own, alluded to above, swarmed and settled in an apple-tree, after which a messenger was procured, and sent to me, then two miles off. I went myself, and shook them in Mr. Nutt's box for the first time. The reason was I had the key of the room in my pocket, and my friends could not get at the box. The man's bees, above noticed, were left so long because his wife was afraid of them, and his dwelling was in a lonely place.

The above are facts that may be doubted, but cannot be disproved. Another season, I may, if you desire it, favor you with my further progress; or I may, in the mean time, with your permission, point out some other matters your correspondent has very much erred in.

GEORGE WILLIAM WOOD.

Germo, near Helston, Cornwall, Oct. 1, 1834.

METALS.—The following may not be uninteresting to many of our readers.

Tin.

There are several sorts of this metal.

Cornish block tin, in large blocks of about 300 pounds each, or small blocks of 30 or 35 pounds; this is obtained from tin ore mixed with copper pyrites; it does not contain more than one five-hundredth of other metals; seldom, indeed, more than one-thousandth of copper, which, when the metal is dissolved, separates in the form of a black oxide, represented by the advocates of medical police as arsenic.

Refined block tin, in small ingots of from one pound and a half to two pounds, or in rods of a half pound each.

Grain tin, in blocks of 120 or 130 pounds, but is generally in fragments resembling rocks, which form is given it by letting the blocks fall from a great height while hot. It is obtained from the pure oxide of tin, of the stream works of Cornwall, very brilliant, and the purest English tin: seldom containing more than one ten-thousandth of iron, and is usually 20*s.* or 30*s.* by the cwt. dearer than block tin.

German tin, in bricks of about 8 or 10 pounds each; it contains much iron, and is liable to become spotty with rust.

Malacca tin, imported from the East Indies in pyramidal ingots, of different sizes, from a half pound to one pound and a quarter. This is esteemed the purest kind, and used in making organ pipes, and other nice work.

Banca tin, from Siam, in flat blocks of 120 to 130 pounds: also very pure.

German Tin.

This tin is usually found in the form of oxide, and smelted in blast furnaces, which, in different countries, vary in height: the ore being first stamped and washed.

At Slackenwald, in Bohemia, the tin ore, which is mixed with iron pyrites and arsenical pyrites, is first stamped, washed, and roasted, in parcels of 4 cwt. in a reverberatory furnace, for from 3 to 6 hours. The white arsenic is collected in a subliming room, about 300 feet long, forming a horizontal communication between the furnace and its chimney. This subliming room is opened twice a year, and about 50 cwt. of white arsenic extracted each time. Part of the white arsenic is distilled with sulphur in cast iron retorts, and thus made into red and yellow arsenic.

The roasted ore is washed upon sleeping tables, and the pyrites, now rendered lighter, carried off by the water; which also takes away about fourteen pounds of copperas from each 40 cwt. roasted ore.

10 cwt. of this washed ore, well moistened, is then smelted every 24 hours in a low furnace, with moistened charcoal, to damp the fire. The smelting lasts about 16 hours, and the eye being pierced four times, about 4 cwt. of tin are obtained; 100 cubic feet, or 920 pounds of charcoal, are consumed.

A continual smelting is kept up in these furnaces for a fortnight, during which time 300 cwt. of dressed ore yields 125 cwt. of tin, and about 210 cwt. of charcoal is consumed. Hence, this furnace consumes only seven-tenths of the charcoal that would be required for the smelting of the same quantity of ore in the low blast furnaces; and there is a still greater saving of time, as this high furnace furnishes twice the quantity of metal in a day more than the other.

These high blast furnaces, however, although a trial has been made of them in Cornwall, have not been approved there, probably from want of knowing the

minute attention which certain parts of the process may require.

Grain Tin.

In Cornwall, the alluvial tin ore, or stream tin, obtained from the stream works, and which is composed of pure oxide of tin, without any admixture of pyrites, arsenic, blende, or copper, is smelted in blowing houses, in low blast furnaces like the German, but open at top; 15 cwt. of clean ore generally yields in twelve hours 10 cwt. of grain tin, and the smelting consumes 280 cubic feet, or about 23 cwt. of charcoal. The bottom of the furnace is a mere slab of granite, and the eye being always open, the metal runs in a channel three feet long, in order to allow the slag to be taken off into a basin; from whence it is ladled into an iron kettle, where it is refined by keeping pieces of charcoal soaked in water, under its surface, then scummed, and laded into moulds. The slags are passed four times through the same furnace; and afterwards stamped, to separate any metallic grains.

Mine Block Tin.

The mine tin of Cornwall, or that extracted from the veins in the mines, is stamped, washed, and then roasted in a reverberatory furnace. The roasted ore is then stamped and washed again, until it becomes so clean as to yield, by assay, one-half or three-fourths its weight of tin. It is then sold to the smelting houses.

The roasted ore is mixed with a little coal, or Welch culm, and some slaked lime, the whole well moistened, and smelted in a reverberatory furnace, which is seven feet long, five broad, and about fifteen inches deep, 7 cwt. of the ore are smelted at once, and yield about two-thirds its weight of tin.

To obtain 100 pounds of tin, there is consumed, in the roastings, 38 pounds of coal, and in the smelting, 170 pounds; in all, 208 pounds of coal.

The tin that remains in the slag is separated by stamping and washing, and is called *prillion;* it is then melted into a mass.

Refined Block Tin.

This block, or common tin, is refined by melting it by a gentle heat, on the bed of a reverberatory furnace, and allowing it to run as it melts into an iron kettle, with a small fire under it: the least fusible substances that may be present are left on the bed. The tin in the kettle is farther refined, by taking it up in a ladle, and pouring it repeatedly into the kettle again, skimming it, and finally keeping it melted for some time, and lading out only the upper part.

Silvering and Gilding by Powdered Tin.

A quantity of pure tin is melted and poured into a box, which is then violently shaken; the metal assumes when cold the form of a very fine gray powder. This is then sifted to separate any coarse particles, and is mixed with melted glue.

When it is to be applied it should be reduced by the addition of water to the consistence of thin cream, and is laid on with a soft brush, like ordinary paint. It appears when dry like a coat of common gray water color, until it is gone over with an agate burnisher, then it exhibits a bright uniform surface of polished tin. If the glue is too strong, the burnisher has no effect; and if too weak, the tin crumbles off under the agate. A coating of white or gold colored oil varnish, or lacquer, is immediately laid over it, according as it may be intended to imitate silvering or gilding.

It is used for covering wood, leather, iron, or other articles in constant wear, as it is very ornamental, and resists the effects of the weather.

Pewter.

There are three kinds of pewter.

1. Plate Pewter, used for dishes and plates; this is the best kind, and contains the smallest quantity of other metals added to the tin, which forms the basis of all sorts of pewter. Seventeen pounds of regulus of antimony, added to 100 of tin, form a good plate pewter; some add a small quantity of copper, zinc, or bismuth. A very fine silver-looking metal is made from 100 pounds of tin, melted with 8 of regulus, 4 of copper, and 1 of bismuth.

2. Trifle pewter is used for making the pots for drinking beer; its quality is inferior to the plate pewter.

3. Ley pewter is used for wine measures, and large vessels; from its specific gravity it must contain more than one-fifth of lead.

The use of pewter vessels has been represented by the advocates of medical police, and of persons interested in the pottery business, as unwholesome. The following experiments show the error of this opinion. Nine vessels of different qualities of pewter were cast, and filled with boiling vinegar, and kept for three days.

The vinegar of the eight first vessels, when assayed by means of the sulphate of potash, did not present the slightest portion of dissolved lead; the ninth was charged with the latter metal. Hydro-sulphuretted water discovered the tin which was dissolved in the eight first liquids.

These experiments were repeated three times with vinegar of different strength, and the same results were obtained. The tin, which is always more soluble and more easy to be oxidated than the lead, easily suffers itself to be attacked by the vinegar, but the lead not at all. The vessels, after the vinegar has been kept in them, appear, indeed, of a leaden color, and to abound more with lead than the piece does in its substance; but the slightest friction detaches the light stratum which is formed at the surface, and restores the vessel to its original state.

It is well known that the poorest pewter, such as that of 20 per cent. is never employed in the fabrication of the utensils which serve for preparing and preserving our aliments and drinks. But even though a dishonest pewterer should employ it, his alloy can never be injurious to health, since vinegar may be kept in vessels alloyed with 33 or 50 per cent. of lead, without its being possible to detect a sensible quantity of this metal in it. And as to the arsenic which Malouin, Geoffroy, and Margraaf, had detected in some tin, the supposed danger thence arising was soon dissipated by the work which Bayen wrote upon this subject by order of the police of Paris, and in which he observes that a pewter plate, which he had employed for two years at all his meals, had lost only four grains of its weight, and that the arsenic which could be contained in these four grains, detached by scouring the plate, rather than introduced into the stomach, did not amount probably to one five thousand seven hundred and eightieth of a grain per day.

On Dry Rot.—Dr. Birkbeck's lecture before the Society of Arts, on the preservation of timber and other vegetable substances, was an able exposition of Mr. Kyan's discovery for preventing dry rot, mildew, and decay in timber, canvass, cordage, &c. We have so frequently directed public attention to this principle, that it would now be quite a work of supererogation to say a word on the subject more, than to repeat that a saturated solution of corrosive sublimate, into which the material is placed for a short time, completely preserves it from future decay. Dr. Birkbeck, however, in his admirable address, threw together such a number of instructive observations on vegetable physiology, in reference to the original or natural cause of decay in timber, that it would be improper to pass them in silence. After a cursory review of the fallacious principles of Reid, Jackson, Lewis, Langton, and others, the lecturer noticed the discovery of Berzelius and Fourcroy, (an improvement on that of Sir H. Davy,) relative to the preserving properties of *tannin*, illustrating it by an experiment with a portion of animal gelatine and oak tannin, which produced a precipitate possessing all the principles sought after. The passage of fluid through a woody structure had been clearly demonstrated by De Candolle, and other vegetable anatomists; nay, water found its way through the pores with even greater facility than air; besides, there was the *albumen*, a constituent of vegetable as well as animal substances, distinguished by its property of coagulating when heated, and the *alburnum*, a soft white substance between the inner bark and the wood of trees: these might be considered the natural sources of decomposition. The albumen was more readily decomposed than other parts of the wood; and it had a germinating principle in itself—a soil fitted for the production of the *monas*, and others of the *infusoria* order, observed by Ehrenberg, 500,000,000 of which might be contained in a square inch: these insects were minute enough to find their way throughout the texture of the wood. Again, Count Rumford found, do all he could—and he tried many experiments to expel both air and water—that only three-fifths parts of wood were solid matter, the others being water. How apparent and necessary was it then to effect a vacuum as regarded air and water, and to render the albumen, &c., not decomposable! This was the chief end of Mr. Kyan's valuable discovery. Many well-authenticated specimens of prepared and unprepared materials, deposited for years in the fungus-pit at Woolwich, which possesses such a villanous compound of air that it was remarked neither animal nor vegetable life continued in it, were produced; the effects of mildew and rot were as obvious in the latter as their total absence was wonderful in the former.—[London Literary Gazette.]

Sir Isaac Newton.—Dr. Chalmers, in speaking of Sir Isaac Newton, observes, "that it was a distinguishing and characteristic feature of his great mind, that it kept a tenacious hold of every position that had proof to substantiate it; but a more leading peculiarity was, that it put a most determined exclusion on every position destitute of such proof. The strength and soundness of Newton's philosophy was evinced as much by his decision on those doctrines of science which he rejected, as by his demonstration of those doctrines of science which he was the first to propose. He might easily have palmed loose and confident plausibilities of his own on the world. But no, he kept by his demonstrations, his measurements, and his proofs."

Oxy-Hydrogen Night-Telegraph.—According to announcement, a Mr. Coad, a few days ago, exhibited his oxy-hydrogen gas light on the top of the Egremont hotel, to show its capability for the purpose of night-telegraphs. The light exhibited, though only one sixth part the size of those at the light-house, was little, if at all, inferior to them in brilliancy, and in whiteness, and purity, greatly superior. When at its greatest brilliancy, it threw a beautiful stream of light across the river.—[Liverpool Times.]

Miniature Steam-Ship.—The Earl of Durham, when at Glasgow, inspected, along with some friends, a miniature steam vessel, made by one George Foster a tin-smith. It is 4 feet long, 14 inches broad, and the length of the beam 7 inches; cylinder, 2½ inches; stroke, 3 inches. The steam engine was set to work, and impelled the ship along the Clyde at the rate of ordinary walking.

Improved Locomotive Engine.

To the Editor, &c.

Dear Sir,—A few days since I was invited by one of the managers of the West-Point Foundry to inspect a locomotive engine just completed at that establishment, designed for the Tuscumbia, Courtland and Decatur Railroad; and as its construction is somewhat different from others, perhaps a description of it will be interesting to your readers. It is raised on four 4½ feet wheels; the hubs are of cast iron, with wrought iron spokes and tires; the outside frame is entirely iron, securely bolted; the inside rails are of wrought iron—(hitherto, in all engines made in this country, they have been made of wood;) all the working parts are of cast steel, and appear to have been finished with great care. The weight of the engine, with the boiler, is 6½ tons; it will carry 80 tons at the rate of 18 miles per hour on a level railroad. The appearance of the engine is by far the handsomest I have ever seen, either in this country, or in Europe; and the managers state that the West-Point Association will guarantee that any they may hereafter build shall be equal to any made in the world.

I am, &c. Unit.

New-York, January 15, 1835.

We find the following notice of the completion of the road for which the above engine is intended, in the North Alabamian.

It affords us pleasure to be able to announce to the public the completion of the Tuscumbia, Courtland, and Decatur railroad.

On Monday last, the cars passed through the whole line to Decatur, 45 miles, and have since been actively engaged, both day and night, in the heavy transportation of cotton, merchandize, &c. The unusual activity which has been thus imparted to trade and business of every kind, through the whole line of the road, embracing one of the most fertile and beautiful sections of the state, cannot but be highly gratifying to those who, by their public spirit and untiring exertions, have secured to North Alabama commercial facilities of such incalculable value. Our farmers now have the means of availing themselves of the highest prices for their cotton; the great barriers to a direct market are effectually removed.

Thirty odd cars are now in operation on the road, but we understand the number is quite inadequate to the amount of business required immediately to be done. Other cars are being prepared at the railroad foundry, and another locomotive has been received at New Orleans from Liverpool, which is daily expected at this place. In a few weeks, it is thought, the facilities for transportation will be so increased, as to enable the company to render prompt and efficient attention to all the business which may be required on the road.

Expecting at a proper time to be officially furnished with facts and estimates in regard to the cost, profits, &c., of the road, we shall forbear at this time any speculations of our own. It may not be amiss, however, to remark, that upwards of 25 miles of the work have been made during the last year, at an average expense of something less than $4,500 per mile.